

What is claimed is:

1. A wellhead casing hanger, comprising:

a hanger body, said hanger body having a bore extending therethrough and a tapered hanger bowl to receive a plurality of slip segments therein;

5       said hanger body having a stepped outer shoulder, said stepped outer shoulder configured to receive a plurality of load segments thereon;

10       said plurality of load segments axially moveable between a first, contracted position allowing said wellhead casing hanger to pass through a specified minimum bore and a second, expanded position whereby said wellhead casing hanger is suspended on said plurality of load segments when said plurality of load segments engage an annular groove in a wellhead housing;

      said plurality of load segments moved between said first, contracted position and said second, expanded position by engagement of an actuation ring with a shoulder in said wellhead housing; and,

15       said plurality of slip segments having a complementary exterior taper to engage said tapered hanger bowl, said plurality of slip segments coaxially moveable with respect to said tapered hanger bowl.

2. A wellhead casing hanger, according to Claim 1, wherein:

20       said hanger body may be separated into a plurality of bowl sections to allow installing said wellhead casing hanger around a section of pipe extending through said wellhead housing.

3. A wellhead casing hanger, according to Claim 2, wherein:

      said slip segments included a plurality of teeth formed on the interior and exterior thereof.

25       4. A wellhead casing hanger, according to Claim 3, wherein:

      said plurality of teeth formed on the interior of said slip segments are beveled to grip a section of pipe extending through said wellhead housing when said slip segments are moved radially inwardly along said tapered hanger bowl.

5. A wellhead casing hanger, according to Claim 4, wherein:

30       said plurality of teeth formed on the exterior of said slip segments remain perpendicular to said tapered hanger bowl when said slip segments are moved radially

inwardly along said tapered hanger bowl.

6. A wellhead casing hanger, according to Claim 5, wherein:

said stepped outer shoulder includes a cylindrical retainer surface concentric with the axis of said hanger body; and,

5       said cylindrical retainer surface engages said plurality of load segments to positively retain said plurality of load segments in engagement with said annular groove in said wellhead housing.

7. A wellhead casing hanger, according to Claim 6, wherein:

said hanger body has a plurality of axially disposed slots formed therein;

10       a retaining means is positioned in each of said plurality of axially disposed slots, said retaining means engages said slip segments; and,

said retaining means are moveable within said axially disposed slots in said hanger body to control movement of said slip segments along said tapered hanger bowl and into gripping engagement with said pipe extending through said wellhead housing.

15       8. A wellhead casing hanger, according to Claim 7, wherein:

said plurality of load segments includes urging means disposed between adjacent load segments, said urging means urging said plurality of load segments to said first, contracted position.

9. A wellhead casing hanger, according to Claim 8, wherein:

20       said urging means are coiled tension springs.

10. A wellhead casing hanger, comprising:

a hanger body, said hanger body having a bore extending therethrough;

said hanger body having a stepped outer shoulder, said stepped outer shoulder configured to receive an expandible load ring thereon;

25       said expandible load ring axially moveable between a first, contracted position allowing said wellhead casing hanger to pass through a specified minimum bore and a second, expanded position whereby said wellhead casing hanger is suspended on said expandible load ring when said expandible load ring engages an annular groove in a wellhead housing; and,

30       said expandible load ring moved between said first, contracted position and said second, expanded position by engagement of an actuation ring with said annular groove

in said wellhead housing.

11. A wellhead casing hanger, according to Claim 10, wherein:

said hanger body has an interior thread for attachment of a casing string to be suspended by said wellhead casing hanger.

5 12. A wellhead casing hanger, according to Claim 11, wherein:

said hanger body has a reduced exterior diameter on one end to receive a packoff assembly between said hanger body and said wellhead housing.

13. A wellhead casing hanger, according to Claim 12, wherein:

10 said hanger body has an exterior thread adjacent said reduced exterior diameter for attachment of a running tool.

14. A wellhead casing hanger, according to Claim 13, wherein:

said stepped outer shoulder includes a cylindrical retainer surface concentric with the axis of said hanger body; and,

15 said cylindrical retainer surface engages said expandible load ring to positively retain said plurality of load segments in engagement with said annular groove in said wellhead housing.

15. A wellhead system for suspending a plurality of concentric casing strings in a wellhead, comprising:

20 (a) a wellhead housing having a bore therethrough with a shoulder therein and at least one annular groove axially spaced from said shoulder;

(b) a plurality of side outlets within said bore, axially spaced from said shoulder;

(c) a first casing hanger adapted to land in the wellhead housing bore adjacent said shoulder,

25 (i) said first casing hanger having a bore extending therethrough and a stepped outer shoulder, said stepped outer shoulder configured to receive an expandible load ring thereon;

30 (ii) said expandible load ring axially moveable between a first, contracted position allowing said first casing hanger to pass through said wellhead housing bore and a second, expanded position whereby said first casing hanger is suspended on said expandible load ring when said expandible load ring engages said at least one annular groove in said wellhead housing; and,

(iii) said expandible load ring moved between said first, contracted position and said second, expanded position by engagement of an actuation ring with said shoulder in said wellhead housing;

5 (d) a second casing hanger adapted to land in the wellhead housing bore adjacent said shoulder in place of said first casing hanger when a casing string to be suspended becomes stuck in the well bore and renders said first casing hanger unusable,

(i) said second casing hanger having a bore extending therethrough and a tapered hanger bowl to receive a plurality of slip segments therein;

10 (ii) said second casing hanger having a stepped outer shoulder, said stepped outer shoulder configured to receive a plurality of load segments thereon;

(iii) said plurality of load segments axially moveable between a first, contracted position allowing said second casing hanger to pass through said wellhead housing bore and a second, expanded position whereby said second casing hanger is suspended on said plurality of load segments when said plurality of load segments engage said at least one annular groove in said wellhead housing;

(iv) said plurality of load segments moved between said first, contracted position and said second, expanded position by engagement of an actuation ring with said shoulder in said wellhead housing; and,

20 (v) said plurality of slip segments having a complementary exterior taper to engage said tapered hanger bowl, said plurality of slip segments coaxially moveable with respect to said tapered hanger bowl;

(e) at least one packoff assembly sealing the annulus between said wellhead housing bore and either of said first or second casing hangers.

25 16. A wellhead system for suspending a plurality of concentric casing strings in a wellhead, according to Claim 15, wherein:

said second casing hanger may be separated into a plurality of bowl sections to allow installing said second casing hanger around a casing string to be suspended by said second hanger.

17. A wellhead system for suspending a plurality of concentric casing strings in a wellhead, according to Claim 16, wherein:

said slip segments in said second casing hanger include a plurality of teeth formed on the interior and exterior thereof.

5 18. A wellhead system for suspending a plurality of concentric casing strings in a wellhead, according to Claim 17, wherein:

said plurality of teeth formed on the interior of said slip segments are beveled to grip a casing string to be suspended by said second casing hanger when said slip segments are moved radially inwardly along said tapered hanger bowl.

10 19. A wellhead system for suspending a plurality of concentric casing strings in a wellhead, according to Claim 18, wherein:

said plurality of teeth formed on the exterior of said slip segments remain perpendicular to said tapered hanger bowl when said slip segments are moved radially inwardly along said tapered hanger bowl.

15 20. A wellhead system for suspending a plurality of concentric casing strings in a wellhead, according to Claim 19, wherein:

said stepped outer shoulder includes a cylindrical retainer surface concentric with the axis of said second casing hanger; and,

20 said cylindrical retainer surface engages said plurality of load segments to positively retain said plurality of load segments in engagement with said annular groove in said wellhead housing.

21. A wellhead system for suspending a plurality of concentric casing strings in a wellhead, according to Claim 20, wherein:

25 said second casing hanger has a plurality of axially disposed slots formed therein; a retaining means is positioned in each of said plurality of axially disposed slots, said retaining means engages said slip segments; and,

said retaining means are moveable within said axially disposed slots in said second casing hanger to control movement of said slip segments along said tapered hanger bowl and into gripping engagement with said casing string to be suspended by said second casing hanger.

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22. A wellhead system for suspending a plurality of concentric casing strings in a wellhead, according to Claim 21, wherein:

5       said plurality of load segments includes urging means disposed between adjacent load segments, said urging means urging said plurality of load segments to said first, contracted position.

23. A wellhead system for suspending a plurality of concentric casing strings in a wellhead, according to Claim 22, wherein:

      said urging means are coiled tension springs.

10       24. A wellhead system for suspending a plurality of concentric casing strings in a wellhead, according to Claim 23, wherein:

      said first casing hanger has an interior thread for attachment of a casing string to be suspended by said first casing hanger.

25. A wellhead system for suspending a plurality of concentric casing strings in a wellhead, according to Claim 24, wherein:

15       said first casing hanger has a reduced exterior diameter on one end to receive said at least one packoff assembly sealing the annulus between said wellhead housing bore and said first casing hanger.

26. A wellhead system for suspending a plurality of concentric casing strings in a wellhead, according to Claim 25, wherein:

20       said first casing hanger has an exterior thread adjacent said reduced exterior diameter for attachment of a running tool.

27. A wellhead system for suspending a plurality of concentric casing strings in a wellhead, according to Claim 26, wherein:

25       said stepped outer shoulder of said first casing hangers includes a cylindrical retainer surface concentric with the axis of said first casing hanger; and,

      said cylindrical retainer surface engages said expandible load ring to positively retain said expandible load ring in engagement with said annular groove in said wellhead housing.

28. A full bore test plug for use in a wellhead system, comprising:

30       a test plug body, said test plug body having a threaded connection on its upper and lower ends to receive a handling joint therein;

said test plug body having a stepped outer shoulder, said stepped outer shoulder configured to receive a plurality of load segments thereon;

said plurality of load segments axially moveable between a first, contracted position allowing said test plug to pass through a specified minimum bore and a second, expanded position whereby said test plug is suspended on said plurality of load segments when said plurality of load segments engage an annular groove in a wellhead housing; and,

said plurality of load segments moved between said first, contracted position and said second, expanded position by engagement of an actuation ring with a shoulder in said wellhead housing.

29. A full bore test plug for use in a wellhead system, according to claim 28, including:

a seal ring positioned on said test plug body to engage a seal bore in said wellhead housing when said load segments are in said second, expanded position.

30. A full bore test plug for use in a wellhead system, according to claim 29, wherein:

said stepped outer shoulder includes a cylindrical retainer surface concentric with the axis of said test plug body; and,

said cylindrical retainer surface engages said plurality of load segments to positively retain said plurality of load segments in engagement with said annular groove in said wellhead housing.

31. A full bore test plug for use in a wellhead system, according to claim 30, wherein:

said plurality of load segments includes urging means disposed between adjacent load segments, said urging means urging said plurality of load segments to said first, contracted position.

32. A full bore test plug for use in a wellhead system, according to claim 31, wherein:

said urging means are coiled tension springs.